iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** IV **Month of publication:** April 2019

DOI: https://doi.org/10.22214/ijraset.2019.4524

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

A Survey on Network-Aware Feasible Repairs for Erasure-Coded Storage

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Abstract: ***Recent researches on erasure coding for distributed storages have shown us various error detection and correction methods and strategies. Several studies have shown distinct erasure codes for repair strategies ranges three.***
We propose a general mechanism that showcases the opportunity for possible repairs and examine how many different types of erasure codes benefit by being network aware. In order to guarantee data reliability, erasure codes have been used in distributed storage system. Nevertheless, this mechanism suffers from the repair problem that excess data are needed to repair a single failure, causes both high bandwidth consuming for the network and heavy computing load on the replacement node. To reduce repair traffic, researches pointed out the tradeoff between storage and repair traffic which proposed regenerating codes by combining network coding. In this paper, determine the set of feasible repair for random linear network coding (RLNC) and system of efficient checks using techniques from the arsenal of dynamic programming.
Keywords: Erasure codes, data reliability, reduce repair traffic, combining network coding, RLNC (random linear network coding.

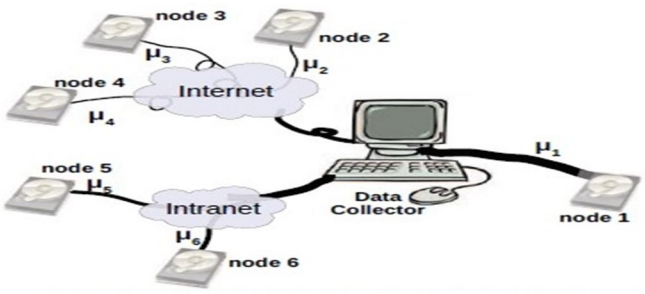
I. INTRODUCTION

In recent years, distributed storage systems (DSS) had a lot of changes through erasure coding as a means to control the costs of data and ensuring the reliable working of storage. Even though traditional distributed storage systems use same means of replication to ensure data resilience, erasure coding provides far better resilience while using a fraction of the raw storage capacity required for replication. The arrival of new technologies and also the increase in storage volume shows that erasure coding will continue to rise and the importance will reach its peak in terms of design. Encode and decode operations to GPUs, FPGAs or use of modern software libraries such as ISA-L, promises to lower the computation costs of these operations. NVM(Non-Volatile Memory Express) has the most IO capacity, as compared with earlier SSD devices, promises to lower the effective IO costs associated with coded storage. We review related work on the repair problem for erasure coding based distributed storage system. These researches hardly change the nature of repair cost, especially when transplanting these methods in more distributed environment. The outcome of RGC first clarifies the relationship between storage and repair traffic. This number scales linearly when multiple repairs need to be checked, making it inefficient for propped network-aware solution. In this paper, we present a new way of repairing failure in erasure coding-based distributed storage system. We propose a mechanism to reduce the number of computation based on elimination. Beyond reducing the computational load on the system, it plays an important role in our proposed framework by decreasing the time necessary to find a set of feasible repairs. To reduce repair traffic, researches pointed out the tradeoff between storage and repair traffic and proposed regenerating codes by combining network coding.

II. RELATED WORK

A. A Flexible Class of Regenerating Codes for Distributed Storage

In this paper they have introduced units of data that are sores in various nodes *n*, in such a way over the network each node can be recovered by connecting to *k* node. Additionally, can be repaired by connection to the proposed *d* node from each other. A new framework is proposed above by whose sum capacity equals or exceeds a predetermined parameter.



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B. A Fundamental Trade-off Between The Download Cost And Repair Bandwidth In Distributed Storage Systems

This paper they have talked about fundamental trade-off between the download cost and repair bandwidth, they have introduced generalized regenerating codes which replaces the traditional regenerating codes introduced by A. G. Dimakis, P. G. Godfrey, Y. Wu, M. J. Wainwright, and K. Ramchandran,"Network coding for distributed storage systems," Submitted to IEEE Transactions of Information Theory. Having access to the data of k storage nodes out of existing n nodes is enough to regenerate the original data node. Thus, the new node needs to connect to exactly $d = k$ nodes and downloads all of stored data ($\alpha = M/k$), thus $\beta = \alpha = M/k$. So the repair bandwidth is the same as the size of datafile, i.e., $\gamma = d\beta = M$.

C. A Piggybacking Design Framework for Read-and Download-efficient Distributed Storage Codes

This paper has provided new framework for the earlier distribute design of codes which are more efficient in rad and download during a node repair. This can save somewhere between 25 to 50% during the data being read and downloaded during repair.

1) Maximum distance separable (MDS), high-rate, and having a small number of sub stripes,
2) Binary MDS codes for all parameters where binary MDS codes exist, and
3) MDS codes with the smallest repair locality.

A code for efficient repair of parity nodes constructed using the piggybacking framework. It uses two stripes of the code and a piggyback is added from the first stripe to the second stripe.

D. Reducing Repair Traffic For Erasure Coding Based Storage Via Interference Alignment

In the concepts, the distributed storage are mostly consists has limited amount of capacity and also improve the reliability of disturbing data over multiple nodes. If the node is disfigure, to stop the system reliability to revert, it is consist to regenerate a new node which contain same quality of data as damaged node to keep the list of storage node, which having the above reliability.

It is also used to download the need of information, also contains some amount of bandwidth which is connected with new node to exiting nodes. This process is called has repair bandwidth. In disturbing storage system of date should store in long term of time in this process, It has individual failures which have long –period durability. It has two advantages which has both replication and erasure coding. The replication is consists of simple decoding method and erasure coding is consist of low storage capacity…although, the erasure code provide the same repair bandwidth as contrast to the replication code.

The cost bandwidth trade off distributed storage system, the download cost of storage node is not same as before. We focus on two sets of nodes, each having dissimilar download costs. Information flow graph, a new different of regenerated codes called generalized regenerating code….this code has lower download cost, which has marginal increase in the repair bandwidth….

E. Erasure Coded Storage On A Changing Network: The Unfold Story

The distributed storage system has shift towards the erasure coding, it used to control the cost of storing and ensuring the flexibility of large volume of data. It has new technologies and increasing storage volume requirement propose that erasure coding.

This system has encode and decode operation of GPUS,FPGAS and it also used for modern software libraries such as ISA-L jerasure and KODO it is consists lower computation cost of operations. In this this concepts, it has several codes which perform the repair nodes, it has more efficiently have emerged employing techniques which consists of function repair, interference alignment and piggybacking. Erasure code network have minimum storage regenerating code which store less amount of data to reach the level of redundancy. Finally, we have shown the result of network condition benefits a wide range of erasure codes. This concept provided systematic results to decrease the space of same feasible repairs and it hopes to make good advances in this areas. It has carry on the work to characterize and reduce the complexity of practically checks.

F. How Good is Random linear Coding Based Distributed Networked Storage?

This concepts is above, the distributed file system. It is consists of client and server model. In this system has some problem which is: how to store files in a large distributed system in efficient manner? It has suitable design in file distribution strategies can used to find the application in content-distributed network, peer-to-peer networks and also distribution libraries. The files are transferred through the internet is the client and server model. It has one advantage is only the client can speak to server and not each other. This process is simple and setup, the client and server has important problem with files that are large and very popular. This concepts is used to distribute the load across multiple servers, it has another method peer-to-peer networks. And also, it has many properties such as stateless, independence, performance guarantee. A random linear coding based storage, motivated by random network coding, which makes the system have different storage-locations. The download used to connect, the complete coordination of storing different chunks of file. In this concept, a random linear coding based strategy can be called erasure coding on the fly.

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G. Distributed Storage codes with Repair-by-Transfer

In a distributed storage system, the data file is spread across nodes in a network in which means that an end-user. This option that used to reduces network congestion and guides to increased flexibility in the face of node failure.

For example, it upon maximum-distance-separable (MDS) codes such as Reed-solomon (RS) codes. The data stored in network represents has B message symbol, each message symbol worn from a finite field Fq of size q. The entire data can be recovered by a data- collector by connecting to any arbitrary K=B nodes. The distributed storage system consists as RAID-6, ocean store, total recall, employ which as erasure-coding option. An explicit exact MBR code parameter (n, k, d=n-1). This is very low repair complexity; the repair of failure node can transfer of data and does not require any computation.

H. A Realistic Distributed Storage System That Minimizes Data Storage And Repair Bandwidth

In this concept, all the data are placed in nodes which connected through a network, if one of the nodes fails. It is known that the use of erasure coding improve the minimizes the amount of stored data and fault tolerance. We using communication (bandwidth) cost, for example storage clouds, the data is placed in storage devices, it is usually organized in a rack, which has metallic support design. The communication cost within the rack is lower than the communication cost within a different rack. The optional tradeoff is used to repair bandwidth needed to regenerate a failed node. The tradeoff represent has a curve, which has two external point of curve called minimum storage regenerating (MSR) point and minimum bandwidth regenerating (MBR) point

It has another model, where there is static classification of “cheap bandwidth” and “expensive bandwidth”. In new model, the cost of downloading data units from the racks introduced the rack model is totally analyzed that there are two racks. The different between model and preview model are show. We also analyze the repair cost of the new model, and conclude the rack model to perform preview models in terms of repair codes.

I. Data Harvesting A Random Coding Approach To Rapid Dissemination And Efficient Storage Of Data

In this concept, we use the random linear coding (RLC) to develop the efficient protocol. It has two key problems in distributed system the problem of disperse information rapidly and another problem is efficiently storing a large file in distributed system. In point-to-multipoint grid network is used in this concept, they have simultaneously disperse RLC is more dramatic than point-to-point scenario. We also consider, they are n no of storage location, each have very limited space to store.

Each storage location choose the part of the file without the knowledge of the previous file which stored in the location.in RLC based, the minimum number of storage location need of connect, where there is complete coordinate with storage location and the downloader. For the distributed system problem, we consider a static model our results with this show a large file are stored in distributed system, it will not coordinated a coding based approach, it makes the system behave a storage node coordinate with themselves. The downloader of view , it use to connected with number of peer close to “total pieces of file” separated by “number of pieces” in each peer can store.

J. Improved Bounds On The Decoding Failure Probability

It has multi-source multi-relay network, a coding scheme is based on random linear network coding which is source the packet and generate the coded packets. This link has two nodes which is source-to-relay and relay-to-destination. This concept, consider linear network coding over the network, where N is the source node and M is the relay node for the delivery of packets over the erasure channels. The values of N, M and the size of the finite field, the existing lower bound is independent of the field size.

To derive improved bound is probability of failure, the proposed bound incorporates the effect of field size. It used to improve upper and lower bound on the decoding failure in multi-source and multi-relay network. The proposed analyze are provide significant tight on bounds. It has several examples, which have various source nodes and relay nodes. Finally, the proposed bound used to better estimate the system employing sparse random linear network coding scheme.

K. Double Regenerating Codes For Hierarchical Data Centers

In this concept, the erasure coding ensures the fault tolerant with low redundancy. The hierarchical nature of data center oversubscribed cross-rack bandwidth in failure repair. The double regenerating codes (DRC), is used to perform two-stage regeneration it also minimizes the repair bandwidth for single node with minimum redundancy. This concept focuses on erasure code construction that has maximum distance separable (MDS) property, the erasure coding used to perform in storage efficiency.

The double regeneration makes two trade-off, they are first it can only tolerate single-rack failure. However, rack failure is rare than node failure .we can also use inner-rack repair bandwidth for cross-rack repair bandwidth.in this paper, we have double regenerating codes for erasure coded storage in data centers. They show its existence and reveal the repair successfulness of DRC.

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L. Tree-Structured Data Regeneration In Distributed Storage Systems With Regenerating Codes

In this paper, we have large scale distributed storage system to provide dependable service of data storage, a degree of data redundancy in a decentralized manner, which has large number of storage node in the system. It also organized a peer-to-peer fashion. Actually, storage nodes are may fail to lead a data loss, storage node failure as the rule, not the exception. The storage node may fails, it is required to regenerate data with replacement node, called has newcomer.

In this concepts, we consist of constructing has tree-structured regeneration topologies, as well as the use of regenerating codes are storage-bandwidth optimal trade-off curve. To analyze the algorithm and its bandwidth of tree structured regenerating with s variable number of TREE. Finally, the theoretical advantage of tree based simulation and occurrence.

M. Network Information Flow

Our problem is network information flow in computer network application .we consist of point to point communication network it has number of information source has multicast to certain sets of destinations. The result can be consider as the max-flow, min-cut theorem for network information flow. This may have significant on future design of switching systems. In this paper, the graph G represent a physical network, set of multicast may represent the aggregated traffic pattern the network to support. In existing networks, it either relays information from input links and output links. Actually the probabilistic coding scheme is mixture of adjective coding scheme

N. Network Coding For Distributed Storage Systems

In distributed storage system, provide dependable access to data through spread over in dependable nodes. The application framework included data center, peer to peer storage system, in wireless network. The erasure coded system, to repair from a single node failure it has new node to reconstruct the encoded data to generate the data block. Application involves storage in system such as store, total recall and DHash++, that nodes used across the internet.

We can divide a file of size M into K piece, we use the (n, k) maximum distance separable (MDS) code. Erasure coding can use orders of magnitude higher dependability for equal redundancy factor which compared to reproduce. Finally, all known coding construct the require access to original data to generate encoded particle.

O. A Random Linear Network Coding Approach To Multicast

A distributed random linear network coding is used for transmission and compression in general multisource and multicast networks. This approach can take advantage of redundant network capacity for probability and strong. Our indication of result has a new bound on involved field size for centralized network coding on general multicast network.

Here an efficient distributed approach the effect this capacity. We consist of general framework multisource and multicast, with related sources on networks.

The problem includes single-source multicast of problem for sensor network. If the network and network codes are fixed, that has a source to send to the start of operation, a basis through the network. This approach is not only recovers the capacity rate, it also have number of advantage random design of codes was consider. Finally, we consider the distributed random network coding concurrently effort capacity which has max-flow, min-cut bound of multisource and multicast network.

III. CONCLUSION

The paper reviews the main implementations of erasure coded storage techniques. The ultimate aim of researchers in this area is to enable computers to reduce the data being used for reading or downloaded for repair purpose in a distributed storage environment.

In this paper we have also basically compared the main components of various frameworks proposed.

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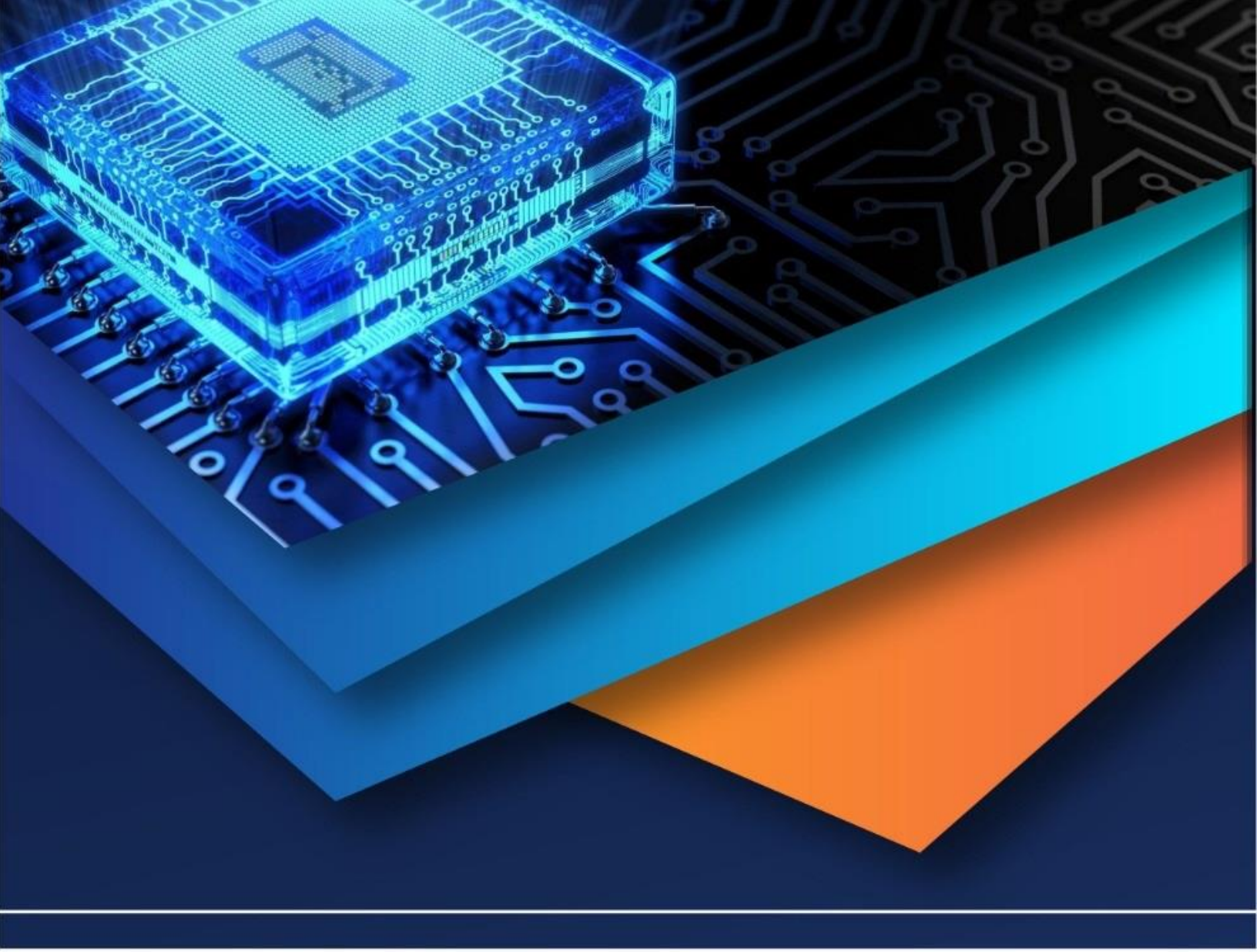
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